Wisconsin eHealth Care Quality and Patient Safety Board
Patient Care Workgroup

Final Report
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PATIENT CARE WORKGROUP
WISCONSIN EHEALTH CARE QUALITY AND PATIENT SAFETY BOARD

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The Patient Care Workgroup was charged to:

1. Define criteria (such as reach, feasibility and impact) to prioritize the key product types (such as Continuity of Care record or other abstract of medical history information, clinical care – public health business interoperability, e-Prescribe, use of statewide guidelines) and identify and prioritize the key product types to be implemented in the Action Plan.
2. Define use case examples (real-world examples) that are appropriate for the first key products.
3. Develop information on current use of electronic health records in Wisconsin.
4. Identify positive opportunities and barriers to wider adoption of electronic health information systems in all types of medical care settings. Recommend strategies to take advantage of opportunities and overcome barriers to foster statewide adoption.

To accomplish these charges, Workgroup members prioritized outcome goals and information products (in collaboration with other workgroups); described a set of specific information products that could produce early value for patients, clinicians and other stakeholders; described the types of regional organizations needed to support such information products and a step-wise fashion in which the work can be approached; described functions that might best be performed at a statewide level; and recommended action to promote the adoption of necessary technology within individual organizations. An inventory of electronic health records and information exchange efforts is underway at the time of this report and will be described in later documents.

Workgroup members first prioritized on the basis of the *urgency* of beneficial changes in health care and public health practice. (The criterion of *feasibility* as opposed to *urgency* was not included in this initial ranking.) A survey was completed by both the Patient Care and Consumer Issues workgroups. Answering in their professional capacities, Workgroup members gave highest priority to (in descending order):

- Clinician access to a patient's information *between* (as well as within) health care organizations
- Avoiding preventable hospitalizations
- Preventing medical injuries
- Accessing a common and comprehensive medication list for each patient
- Providing clinical decision support
- Avoiding duplicate procedures
- Enhancing quality management, and
- Increasing inter-provider collaboration for patient care.

The same individuals, answering as patients or as family care-givers, also prioritized (alongside many of the above):

- Enabling the creation of patient health records (accessible and controlled by the patient)
- Reducing the repetition of registration and health history information
- Enhancing patient or proxy access to their clinical health records
- Enabling e-visits, and
- Increasing cost-awareness of medications, procedures, etc.

Most of these goals depend on the assembly of a patient's health information from across separate organizations. Several of these priorities require a focus on Health Information Exchange (HIE) *between* organizations more than on the adoption of Health Information Technology (HIT) *within* any individual organization.

Feasibility: The feasibility of addressing the above goals (that were selected on the basis of urgency) was subsequently addressed.

The Workgroup concluded that the largest number of highly urgent priorities would be addressed most rapidly by focusing on *clinician* access to information. There are several rationales for this conclusion:

- Clinicians at the point of service are in the best position to improve care quality, safety and efficiency based on better information at the point of service;
- It is much easier to authorize and authenticate licensed health care professionals for Internet access to confidential health information than, for example, to provide the same level of security for members of the general public;
- In the interest of patient-clinician communication and patient education, clinicians often desire to be present when patients access their own health information.

For these reasons, the Patient Care Workgroup decided that providing such information to clinicians at the point of care would provide both the greatest value and be most feasible for early HIE development. Once the infrastructure was developed to assemble and deliver a comprehensive summary of a patient's health information for clinicians, it could be reused in many ways for other desired goals, including direct patient access.

This conclusion is not meant to downplay the importance of patient access, review and use of their own health information, tools permitting patients or their guardians to submit information to health care providers, or to enhance clinician-patient communication. Indeed, various Patient Health Record applications are now provided to patients by health care provider organizations and by health plans. It will be important to link such applications to Health Information Exchanges so they can both benefit from and contribute to the improvement of information access provided by HIE. However, the challenges of validating the identity of millions of patients, of ensuring appropriate physician-patient communication, and of carefully incorporating electronic communication into the workflow of health care argues that these information products be offered to patients by their own providers and plans rather than by HIE organizations in the near term.

The information types listed in Recommendation 3 were selected as those most important to improving patient care safety, quality and value. The bulk of most of these types of information is potentially available without relying on information from individual providers' Electronic Medical Records (EMRs). For example, much demographic information is available from claims or registration data systems; medication information from pharmacies, claims or pharmacy benefit management databases; etc. Thus summaries of such information can be created and shared with users from many already existing sources. They can also be delivered by many existing methods, including fax, secure Internet portal, or display from within an EMR. Because the adoption of EMR applications is likely to be gradual, and is not an absolute prerequisite to develop useful information products, it does not make sense to wait for universal EMR adoption to begin building Health Information Exchanges (HIE) to assemble and share such important information for a patient's care.

Nevertheless, from the perspective of improving the efficiency and quality of care, it is important that such information ultimately be used *from within* the EMR or other end-user application. Parallel, stand-alone information delivery systems often fail to be consulted, create inefficiencies in workflow, and may not interface with real-time automated clinical decision support systems that can alert clinicians of important, sometimes lifesaving, opportunities to avoid injury or implement prevention. Thus, while many early users may receive HIE information by fax or other technologies, it is critical that the data be increasingly standardized over time, such that it can be imported and exported automatically and used within EMRs and other applications. Similarly, it is important that clinicians and others continue to invest in EMRs and other forms of HIT that are certified to meet such interoperability goals. Indeed, the availability of standardized information feeds from an HIE and the certification of interoperable applications are likely to accelerate adoption of technology in the practice setting. Additional recommendations were also made to help accelerate HIT adoption at the same time that HIE networking is being established.

The Workgroup adopted the vision of Connecting for Health and the National Coordinator for Information Technology that at the core of regional Health Information Exchange would be an organization (often referred to as a Regional Health Information Organization - RHIO) that could help competing stakeholders in a region organize electronic information exchange. Such organizations were felt to be most stable and likely to be self-sufficient at the level of the Medical Trading Area, the natural market within which most referrals, hospitalizations, and other flows of both patients and patient information typically occur. Such an area is the geography in which face-to-face trust can most readily be established and within which the bulk of information is currently exchanged (usually on paper) on a daily basis. The RHIO is the organization through which most HIE services are selected, developed and delivered (although technical implementation might be performed by a contracted third party). Which services are selected would depend on the local use cases and business cases judged to lead to a sustainable business model.

The primary functions of these RHIOs are first, to establish the fundamental infrastructure for information exchange (including the trust, governance and agreements that enable exchange as well as the technical infrastructure) and second, to create exchange services that enable information to flow. Based on these two prerequisites, the RHIO, its members, or third-party organizations can create information products that produce real value for patients or other stakeholders. Several use cases were developed to describe information products likely to produce early value for different types of information exchange stakeholders, including patients, clinicians, health care provider organizations, service providers like laboratories, payers and care managers and public health agencies.

Incremental development is advised at the regional level, selecting early exchange services that:
- Are technically feasible and lay the foundation for later, more complex projects;
- Fall within the information-sharing willingness and trust of major stakeholders (including patients);
- Enable desired information products and value creation; and
- Can generate revenue to fund ongoing operation and future expansion of services.

Although RHIOs are most likely to be regional (sub-state, or potentially even interstate in areas where referrals frequently cross state lines) there is also role for a state-wide services provider whose customers are primarily regional HIEs both inside and outside of Wisconsin. Economies of scale favor centralizing certain business functions at a state level.

Recommendations:

Recommendation 1:   The highest early priority for information exchange is to provide real-time access to a patient's high-value clinical information, including access to historical data from across all sources of care (a patient-centric summary). The assembly and delivery of such information in this fashion is a prerequisite to achieving many other desired goals.

Recommendation 2:   Consumers desire access to electronic health information. It is unlikely that HIEs themselves will be able provide PHR applications directly to consumers in the near-term. However other organizations (like insurance companies or hospitals) are providing Patient Health Records (PHR) for patient use. These should link to the health information exchanges to receive and contribute information.

Recommendation 3:   The highest priority information types for information exchange (not ordered by importance) include the following:

- DEMOGRAPHICS
  - Patient identity/demographics
  - Payer/insurance coverage/eligibility
  - Patient contact-in-emergency
  - Advance directives
- CARE HISTORY
  - Patient visits and hospitalizations
  - Visit/encounter diagnoses
  - Discharge summaries/progress notes
  - Procedures
- THERAPEUTICS AND SAFETY
  - Medications
  - Allergies
  - Immunizations
  - Medical devices and implants
- RESULTS
  - Laboratory and other diagnostic results

Information exchange can opportunistically deploy those classes of information that became available first, so as to provide value at the earliest opportunity.

Recommendation 4:   The Patient Care Workgroup recommends that requirements for prior patient consent that exceed Federal minimums to deliver clinical information to treating clinicians be reduced or eliminated so as to increase the patient benefit from treating clinician access to comprehensive information at the point of service.

Recommendation 5:   e-Prescribing should ideally:

- Be integrated into the clinical workflow as part of an electronic medical record (EMR) system;
- Utilize information from both the clinician EMR and from the regional Health Information Exchange to improve the quality of clinical decision support applications;
- Contribute information on prescribing and dispensing to the regional Health Information Exchange to enrich the quality and timeliness of exchange information.

Recommendation 6:   While many early users may receive HIE information by fax or other technologies, it is critical that the data be increasingly standardized over time, such that it can be imported and exported automatically and used within EMRs and other applications. Similarly, it is important that clinicians and others continue to invest in EMRs and other forms of HIT that are certified to meet such interoperability goals. The availability of standardized information feeds from an HIE and the certification of interoperable applications are likely to accelerate adoption of technology in the practice setting, and vice versa.

Recommendation 7:   Five-year goals for end-user technology include:
- Universal high-speed Internet access for health care providers, service providers, and other professional stakeholders
- Affordable EMR systems capable of importing and exporting the priority data set accessible to all clinical providers. (This is likely to emerge in part by Internet-served applications that reduce installation, maintenance, network administration and lifecycle costs for smaller practices);
- Patients should have universal access to high-speed Internet in their community, if not in their home.

Recommendation 8:   Most information exchange should be developed at the regional (sub-state) level by Regional Health Information Organizations serving market-defined Medical Trading Areas.

Recommendation 9:   Inside Wisconsin a statewide organization could provide the following services (particularly if state government were an active participant):

Assuring and assisting regional HIEs to utilize common standards for data transmission, vocabulary and other key functions to permit exchange of information between and beyond Wisconsin HIEs as needed.
- Leveraging existing or future statewide information systems or data sets to help regional HIEs implement foundational infrastructure, such as a secure user identity management, master patient indexing, or record locating services. For example, a state licensing and registration system be used to help validate clinical users, or the statewide immunization registry could provide information useful for creating a regional master patient index.
- Obtaining, standardizing and providing for regional HIE use data sets created by state government or other statewide entities (for example, immunization and disease registries, and Medicaid claims information). Access to such information could be obtained by purchase, by policy or a combination of the two.
- Obtaining and providing (benefited by larger-scale purchasing power) data sets created by national or other large scale organizations (for example national laboratories or the RxHub pharmacy benefit data hub). Access to such information could be obtained by purchase, by policy or a combination of the two.
- Managing requests for information between regional HIEs: for example, when a patient requires care outside her home region and her provider seeks historical information.
- Managing interactions between regional HIEs and the Nationwide Health Information Network (NHIN).

Recommendation 10: Regional HIEs should pursue incremental development of exchange services, focusing initially on those that build foundational infrastructure needed for later, more advanced

exchange services. Early services and products should also be selected on the basis of a sustainable business model that creates a foundation of revenue and trust for later service expansions.

Recommendation 11: Emerging HIE initiatives should seriously consider implementing result delivery and clinical document delivery as early exchange services, because these build foundational infrastructure, stakeholder trust and sustainable revenue flow and administrative savings to support additional, later exchange projects.

Recommendation 12: In regard to HIT adoption:

a. The DOQ-IT program for adoption of electronic medical records should be supported and expanded. The focus should expand it to include specialty practices in addition to primary care.

b. Wisconsin should ultimately subsidize only HIT which is CCHIT-certified and adheres to AHIC (and possibly narrower Wisconsin) standards.

c. Wisconsin should address workforce issues to assure success of HIT adoption efforts.

BACKGROUND

Governor Jim Doyle created the eHealth Care Quality and Patient Safety Board by Executive Order 129 on November 2, 2005. The eHealth Board is charged with developing the Wisconsin *eHealth Action Plan*, Wisconsin's five-year plan for the adoption and exchange of interoperable electronic health records. Five workgroups have been formed to guide development of this plan: Patient Care, Information Exchange, Consumer Interests, Governance, and Financing.

The Patient Care Workgroup was given responsibility for identifying efficient, cost-effective and helpful ways for clinicians to share information that enables patients to get the right care in the right way at the right time; identifying action strategies to achieve the goal of health information availability at the point of care for all providers and patients in Wisconsin within five years or as soon as practicable; and designing strategies to promote the adoption of electronic health records and decision support systems that are useful and used by clinical care providers as well as cost-effective for health care delivery systems and to ensure that products and processes are responsive to consumer interests. In addition to these responsibilities, Workgroup members were asked to consider the opportunities for improved public health system functioning that could be made available through health information technology and exchange.

The Patient Care Workgroup was charged to:

1. Define criteria (such as reach, feasibility and impact) to prioritize the key product types (such as Continuity of Care record or other abstract of medical history information, clinical care – public health business interoperability, e-Prescribe, use of statewide guidelines) and identify and prioritize the key product types to be implemented in the Action Plan.
2. Define use case examples (real-world examples) that are appropriate for the first key products.
3. Develop information on current use of electronic health records in Wisconsin.
4.   Identify positive opportunities and barriers to wider adoption of electronic health information systems in all types of medical care settings. Recommend strategies to take advantage of opportunities and overcome barriers to foster statewide adoption.

The remainder of this document outlines the Patient Care Workgroup's recommendations pertaining to each specific charge outlined in the group's charter.

RECOMMENDATIONS

CHARGE 1: Define criteria (such as reach, feasibility and impact) to prioritize the key product types (such as Continuity of Care record or other abstract of medical history information, clinical care – public health business interoperability, e-Prescribe, use of statewide guidelines) and identify and prioritize the key product types to be implemented in the Action Plan.

1.1 Defining criteria for prioritization: Most urgent impact

Workgroup members first prioritized on the basis of the *urgency* of beneficial changes in health care and public health practice.   (The criterion of *feasibility* as opposed to urgency was not included in this initial process.) A survey was completed by both the Patient Care and Consumer Interests workgroups. Answering in their professional capacities, Workgroup members gave highest priority to (in descending order):

- Clinician access to a patient's information between (as well as within) health care organizations
- Avoiding preventable hospitalizations
- Preventing medical injuries
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- Enhancing quality management, and
- Increasing inter-provider collaboration for patient care.

The same individuals, answering as patients or as family care-givers, also prioritized (alongside many of the above):

- Enabling the creation of patient health records (accessible and controlled by the patient)
- Reducing the repetition of registration and health history information
- Enhancing patient or proxy access to their clinical health records
- Enabling e-visits, and
- Increasing cost-awareness of medications, procedures, etc.

Most of these goals depend on the assembly of a patient's health information from across separate organizations, which raises important issues about the ownership and use of information.

1.2 Developing criteria for prioritization

Feasibility: The feasibility of addressing the above goals (that were selected on the basis of urgency) was subsequently addressed.

The Workgroup concluded that the largest number of urgent priorities would be addressed most rapidly by focusing on *clinician* access to information. There are several rationales for this conclusion:

- Clinicians at the point of service are in the best position to improve care quality, safety and efficiency based on better information at the point of service;
- It is much easier to authorize and authenticate licensed health care professionals for Internet access to confidential health information than, for example, to provide the same level of security for members of the general public;
- In the interest of patient-clinician communication and patient education, clinicians often desire to be present when patients access their own health information.

For these reasons, the Patient Care Workgroup decided that providing such information to clinicians at the point of care would both provide the greatest value and be most feasible for early HIE development. Once the infrastructure was developed to assemble and deliver a comprehensive summary of a patient's health information for clinicians, it could be reused in many ways for other desired goals, including direct patient access.

This conclusion is not meant to downplay the importance of patient access, review and use of their own health information, tools permitting patients or their guardians to submit information to health care providers, or to enhance clinician-patient communication. Indeed, various Patient Health Record applications are now provided to patients by health care provider organizations and by health plans. It will be important to link such applications to Health Information Exchanges so they can both benefit from and contribute to the improvement of information access provided by HIE. However, the challenge of validating the identity of millions of patients, of ensuring appropriate physician-patient communication, and of carefully incorporating electronic communication into the workflow of health care argue that these information products by providers and plans rather than by HIE organizations in the near term.

Recommendation 1:   The highest early priority for information exchange is to provide real-time access to a patient's high-value clinical information, including access to historical data from across all sources of care (a patient-centric summary). The assembly and delivery of such information in this fashion is a prerequisite to achieving many other desired goals.

Recommendation 2:   Consumers desire access to electronic health information. It is unlikely that HIEs themselves will be able provide PHR applications directly to consumers in the near-term. However other organizations (like insurance companies or hospitals) are providing Patient Health Records (PHR) for patient use. These should link to the health information exchanges to receive and contribute information.

1.3 Key Product Types – HIE versus HIT

For several reasons, the Workgroup focused primarily on Health Information Exchange (as opposed to Health Information Technology adoption within organizations).   Rationales include:

- Health Information Technology (HIT) adoption and installation is useful, but not an absolute prerequisite for developing useful Health Information Exchange (HIE);
- The business case for HIT adoption and installation is greatly strengthened by the availability of standardized electronic data that can be imported and exported from such technologies. HIE is the most promising path to such standardized data, and thus would increase HIT adoption;
- HIT may have limited power to improve care so long as comprehensive patient health information assembled from multiple sources is lacking;
- HIT adoption and installation needs to be part of the internal business logic of individual health care organizations

For these reasons the Patient Care Workgroup focused primarily on HIE as a key product for the *eHealth Action Plan*. However, consideration was also given to accelerating HIT adoption (see later sections).

1.4 Key Product Types: Data to be exchanged

Working jointly, the Patient Care and Consumer Interests workgroups selected the following information types as most immediately useful to improve quality, safety, value and public health.

Recommendation 3:   The highest priority information types for information exchange (not ordered by importance) include the following:

- DEMOGRAPHICS
    - Patient identity/demographics
    - Payer/insurance coverage/eligibility
    - Patient contact-in-emergency
    - Advance directives
- CARE HISTORY
    - Patient visits and hospitalizations
    - Visit/encounter diagnoses
    - Discharge summaries/progress notes
    - Procedures
- THERAPEUTICS AND SAFETY
    - Medications
    - Allergies
    - Immunizations
    - Medical devices and implants
- RESULTS
    - Laboratory and other diagnostic results

1.5 Key Product Types: Limitations on patient information to be provided to treating clinicians without prior patient consent

The Patient Care Workgroup also considered the circumstances under which personal health information should be shared with clinicians without explicit patient authorization. In several circumstances, a clinician actively providing care to a patient might be deprived of information under current Wisconsin law unless explicit consent was obtained from the patient. Theese requirements, which exceed Federal HIPAA and other laws, establish technical and workflow problems that may make it difficult to obtain and document patient consent, and thus deprive both clinicians and patients of the benefits of greater information availability at the point of service. For this reason:

Recommendation 4:   The Patient Care Workgroup recommends that requirements for prior patient consent that exceed Federal minimums to deliver clinical information to treating clinicians be reduced or eliminated so as to increase the patient benefit from treating clinician access to comprehensive information at the point of service.

1.6 Key Products: e-Prescribing

There is high interest in the implementation of electronic prescribing (e-Prescribing) in Wisconsin, which allows clinicians to enter prescription information one time in an electronic environment, enables clinical decision support to assess both drug safety and formulary compliance, and may

reduce adverse drug events due to transcription error. However, the Patient Care Workgroup does not recommend introducing e-Prescribing as a stand-alone application. Instead:

Recommendation 5: e-Prescribing should ideally:

- Be integrated into the clinical workflow as part of an electronic medical record (EMR) system;
- Utilize information from both the clinician EMR and from the regional Health Information Exchange to improve the quality of clinical decision support applications;
- Contribute information on prescribing and dispensing to the regional Health Information Exchange to enrich the quality and timeliness of exchange information.

1.7 Key Products- Infrastructure for HIE and the acceleration of HIT adoption:

The Patient Care Workgroup concluded that the bulk of most of these types of information was potentially available without relying on information from individual providers' Electronic Medical Records (EMRs). For example, much demographic information is available from claims or registration data systems; medication information from pharmacies, claims or pharmacy benefit management databases; etc. Thus summaries of such information could be created and shared with users by many different existing sources. They can also be delivered by many existing methods, including fax, secure Internet portal, or display from within an EMR.   Because the adoption of EMR applications is likely to be gradual, and is not an absolute prerequisite to develop useful information products, it does not make sense to wait for universal EMR adoption to begin building Health Information Exchanges (HIE) to assemble and share such important information for a patient's care.

Nevertheless, from the perspective of improving the efficiency and quality of care, it is important that such information ultimately be used *from within* the EMR or other end-user application. Parallel, stand-alone information delivery systems often fail to be consulted, create inefficiencies in workflow, and may not interface with real-time automated clinical decision support systems that can alert clinicians of important, sometimes lifesaving, opportunities to avoid injury or implement prevention. Thus, while many early users may receive HIE information by fax or other technologies, it is critical that the data be increasingly standardized over time, such that it can be imported and exported automatically and used within EMRs and other applications. Similarly, it is important that clinicians and others continue to invest in EMRs and other forms of HIT that are certified to meet such interoperability goals.   Indeed, the availability of standardized information feeds from an HIE and the certification of interoperable applications are likely to accelerate adoption of technology in the practice setting.

Recommendation 6:   While many early users may receive HIE information by fax or other technologies, it is critical that the data be increasingly standardized over time, such that it can be imported and exported automatically and used within EMRs and other applications. Similarly, it is important that clinicians and others continue to invest in EMRs and other forms of HIT that are certified to meet such interoperability goals. The availability of standardized information feeds from an HIE and the certification of interoperable applications are likely to accelerate adoption of technology in the practice setting, and vice versa.

Recommendation 7:   While EMRs and similar technologies are currently used in a minority of practices, and alternate technologies such as fax transmission may persist for several years, the

eHealth Action Plan should look forward to increasing adoption and use of direct Internet-exchange of information by stakeholders. Toward this end, our five-year goals for end-user technology include:

- Universal high-speed Internet access for health care providers, service providers, and other professional stakeholders;
- Affordable EMR systems capable of importing and exporting the priority data set accessible to all clinical providers. (This is likely to emerge in part by Internet-served applications that reduce installation, maintenance, network administration and lifecycle costs for smaller practices.);
- Patients should have universal access to high-speed Internet in their community, if not in their home.

The remainder of this section focuses on creating Health Information Exchange. Further considerations on how to spur acquisition of HIT by individual organizations are discussed in a later section.

1.8 Key Product Types - Regional and State Health Information Exchange (HIE) service providers

The Workgroup adopted the vision of Connecting for Health and the National Coordinator for Information Technology that at the core of regional Health Information Exchange would be an organization (often referred to as a Regional Health Information Organization - RHIO) that could help competing stakeholders in a region organize electronic information exchange. Such organizations were felt to be most stable and likely to be self-sufficient at the level of the Medical Trading Area, the natural market within which most referrals, hospitalizations, and other flows of both patients and patient information typically occur. Such an area is the geography in which face-to-face trust can most readily be established and within which the bulk of information is currently exchanged (usually on paper) on a daily basis. The RHIO is the organization through which most HIE services are selected, developed and delivered (although technical implementation might be performed by a contracted third parties).   Which services are selected would depend on the local use cases and business cases judged to lead to a sustainable business model.

Recommendation 8:   Most information exchange should be developed at the regional (sub-state) level by Regional Health Information Organizations serving market-defined Medical Trading Areas.

Although RHIOs are most likely to be regional (sub-state, or potentially even interstate in areas where referrals frequently cross state lines) there is also a role for a statewide services provider whose customers are primarily regional HIEs both inside and outside of Wisconsin. Economies of scale favor centralizing certain business functions at a state level.

Recommendation 9:   Inside Wisconsin a statewide organization could provide the following services (particularly if state government were an active participant):

- Assuring and assisting regional HIEs to utilize common standards for data transmission, vocabulary and other key functions to permit exchange of information between and beyond Wisconsin HIEs as needed.

- Leveraging existing or future statewide information systems or data sets to help regional HIEs implement foundational infrastructure, such as a secure user identity management, master patient indexing, or record locating services. For example, a state licensing and registration system be used to help validate clinical users, or the statewide immunization registry could provide information useful for creating a regional master patient index.
- Obtaining, standardizing and providing for regional HIE use data sets created by state government or other statewide entities (for example, immunization and disease registries, and Medicaid claims information). Access to such information could be obtained by purchase, by policy or a combination of the two.
- Obtaining and providing (benefited by larger-scale purchasing power) data sets created by national or other large-scale organizations (for example national laboratories or the RxHub pharmacy benefit data hub). Access to such information could be obtained by purchase, by policy or a combination of the two.
- Managing requests for information between regional HIEs: for example, when a patient requires care outside her home region and her provider seeks historical information.
- Managing interactions between regional HIEs and the Nationwide Health Information Network (NHIN).

1.9 Key Product Types - Infrastructure, Services and Products

For the purposes of this report, the following nomenclature will be used:
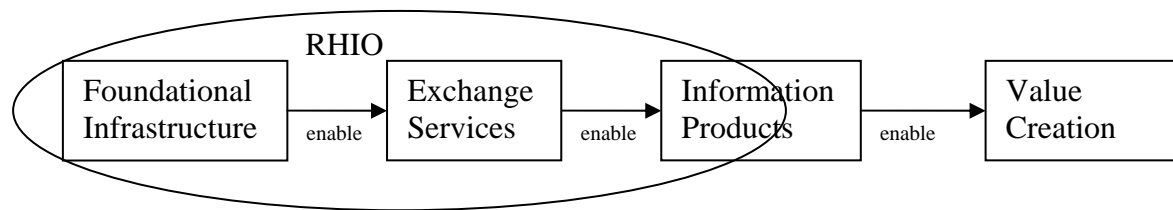
To establish Health Information Exchange in a region, the Regional Health Information Organization needs to establish a basic level of infrastructure (***Foundational Infrastructure***). These are prerequisites for any secure, legal exchange of personal health information. Three types of foundational infrastructure are required for *any* exchange of personal health information. These are:

- AGREEMENTS: to meet both legal and stakeholder requirements, that define the responsibilities of exchange participants in the areas of security, confidentiality, data use and reuse, patient notification and/or consent, funding and other basic issues.
- USER IDENTITY MANAGEMENT: that limits access to authorized, authenticated users and audits use; and
- SECURE NETWORK: that prohibits unauthorized data access and provides the necessary continuity of operation.
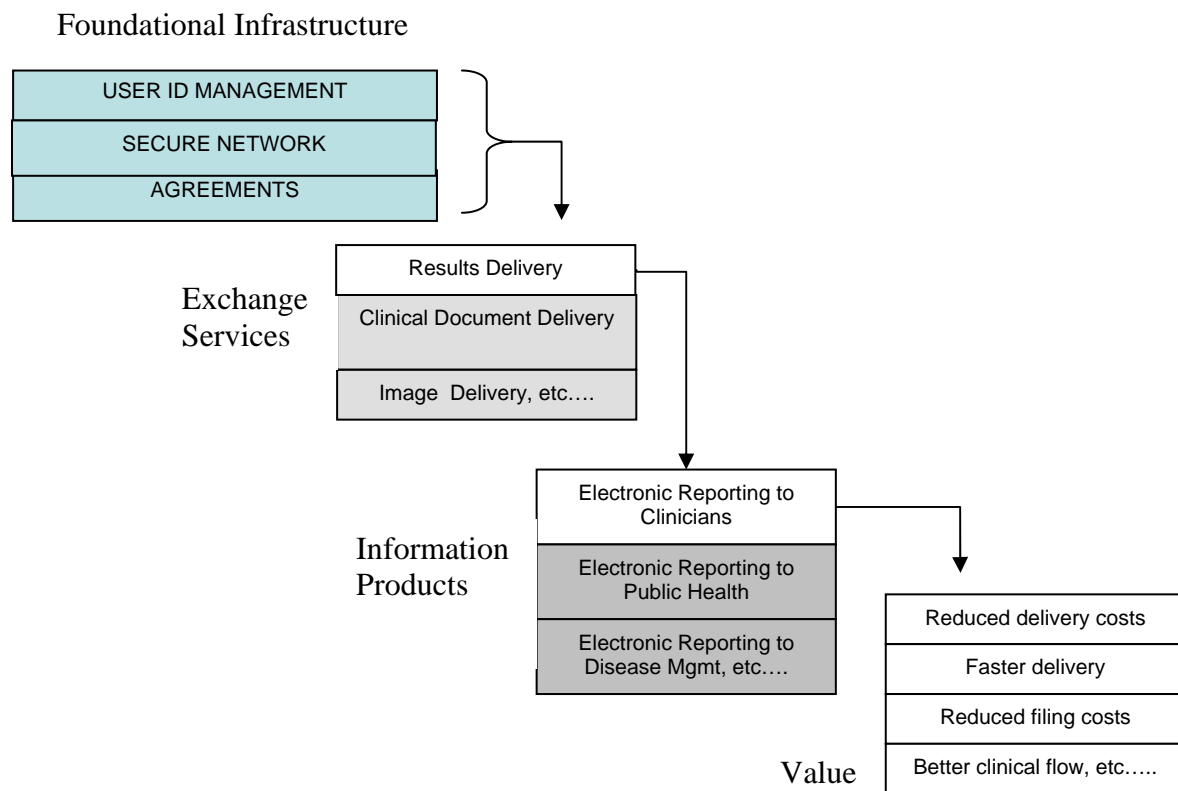
Several types of services can be built on these three foundation building blocks. Additional building blocks of foundational infrastructure are needed for more complex types of services.

Exchange services are the core product of a regional HIE. These are systems that enable information flow from data providers to data users, along with any additional processing required along the way. A simple example of an exchange service (one that only requires the three blocks of foundational infrastructure, above) is results delivery (also called clinical messaging) that permits entities like laboratories to deliver results to clinicians via an exchange.

Once information can flow through an exchange via exchange services, it can be turned into ***information products***, the actual forms in which clinicians, patients and other stakeholders obtain, see or use information provided by the exchange. Information products may be delivered directly by the HIE (for example, in the form of a portal providing access to a particular information view). But they can also be created by HIE participants who buy, lease or build compatible end-user applications (such as an electronic medical record); or by third parties who use exchange services to create value-added products for HIE participants (e.g., an e-prescribing service provider). For example, information provided by the results delivery exchange service could be delivered to patients by a Patient Health Record created and managed by the patient's health care delivery organization.

Value creation only occurs at the end of this chain, when information products reduce costs, improve quality and safety or otherwise improve the functioning and outcomes of health care to the benefit of HIE stakeholders.

In general, a given level of foundational infrastructure can enable the production of several different types of exchange services; each exchange service enables many different information products, and each information product can create several types of value, so a cascade is created moving from left to right.

Foundational Infrastructure

USER ID MANAGEMENT
SECURE NETWORK
AGREEMENTS

Exchange
Services

Results Delivery
Clinical Document Delivery
Image Delivery, etc….

Information
Products

Electronic Reporting to Clinicians
Electronic Reporting to Public Health
Electronic Reporting to Disease Mgmt, etc….

Reduced delivery costs
Faster delivery
Reduced filing costs
Better clinical flow, etc…..

Value

As additional building blocks of Foundational Infrastructure are added, new forms of Exchange Services, Information Products and Value become available, for example:

Foundational Infrastructure

RECORD MATCHING	STANDARDIZED DATA
USER ID MANAGEMENT	
SECURE NETWORK	
AGREEMENTS	

Exchange Services

Patient Record Summary
Quality Monitoring, etc…..

Information Products

Medication List
Historical Result Display, etc…..

Value

Fewer allergic reactions
Fewer drug interactions
Improved formulary management., etc….
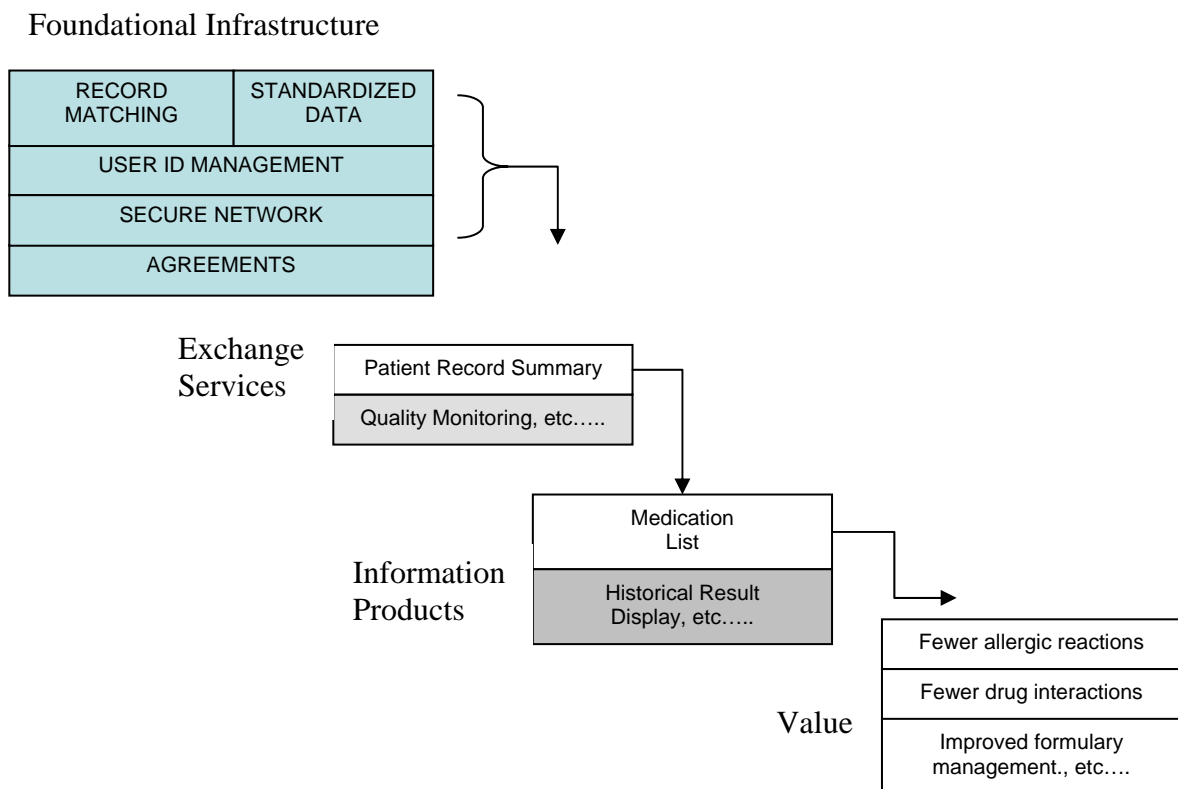
An incremental approach to health information exchange is thus permitted. More sophisticated services require more sophisticated data handling, and as a result, more sophisticated data sharing agreements, data management architecture and technology, in other words, additional layers of foundational infrastructure.

As mentioned earlier, the exchange services offered first by any particular regional HIE need to be based on local needs, data availability and sustainable business models. Services most likely to be offered first in a given region are those which:

▪ Are technically feasible;
▪ Fall within the information-sharing willingness and trust of major stakeholders (including patients);
▪ Enable desired information products and value creation; and
▪ Can generate revenue to fund ongoing operation and future expansion of services.

Regional HIEs can develop exchange services (and the foundational infrastructure they require) incrementally, or they can try to establish several high-level exchange services simultaneously. They might achieve the latter using multi-service solutions from vendors offering sophisticated platforms in a single integrated offering. However, at present, the number and experience of vendors offering proven "turnkey" solutions for multiple services are limited. Also, the complexity of implementation, training and impact on clinical workflow probably argues for incremental development of services rather than rolling out multiple services simultaneously. Finally, the business case to sustain some exchange services (the benefit-to-cost ratio for stakeholders who must

invest in implementation and pay for ongoing operations) is not clear for every type of service at this time. Thus an incremental approach that develops key foundational infrastructure and economically sustainable exchange services in a logical stepwise fashion is endorsed.

This helps explains why some highly desired information products, such as patient-clinician communication tools, are not listed as early use cases for *regional* or *statewide* adoption in Wisconsin. (Even though such information products are not easily produced by Health Information Exchange with today's technology, they might nevertheless be implemented by individual organizations using their own health information technology, which allows solving security and confidentiality problems among established patients and plan enrollees.)

Recommendation 10: Regional HIEs should pursue incremental development of exchange services, focusing initially on those that build foundational infrastructure needed for later, more advanced exchange services. Early services and products should also be selected on the basis of a sustainable business model that creates a foundation of revenue and trust for later service expansions.

1.10 Key Product Types – Early Exchange Services

As noted in the first illustration of foundational infrastructure, exchange services, and information products, one-way delivery of results to clinicians, or of documents between health care providers, is enabled by the most rudimentary level of foundational infrastructure.

Several existing regional HIEs elsewhere in the U.S. have initiated economically-sustainable results delivery and clinical document delivery services. These replace the "Babel" of different methods currently used to deliver results, and eliminates costs associated with redundant list maintenance by every sender. It has sufficiently reduced delivery costs to allow the HIE to recover cost of operations by charging modest sender fees (as the U.S. Postal Service supports operations from the sale of stamps). Because it simply upgrades a system by which information already routinely flows, it generates few new privacy or data use challenges, but establishes underpinnings for more substantive later changes in information flow. Of central importance, it replaces multiple silos of information flow with a single system, and (although it can support current methods clinicians use to receive reports, such as fax) it encourages adoption of digital over paper delivery, which helps drive adoption of health information technology by exchange participants. For these reasons, emerging HIE initiatives should seriously consider implementing results delivery and clinical document delivery as early exchange services that can build trust and a sustainable revenue flow as a foundation for further exchange projects later.

Recommendation 11: Emerging HIE initiatives should seriously consider implementing results delivery and clinical document delivery as early exchange services, because these build foundational infrastructure, stakeholder trust and sustainable revenue flow and administrative savings to support additional, later exchange projects.

1.11 Key Product Types – Implications for Architecture

The top priority is the delivery of real-time, patient-centric, summary information at the point of patient care. This requires that information will be rapidly assembled and transmitted

simultaneously with the patient presenting for health care.   Such rapid assembly information requires:

- Ascertaining which patient's information is desired, out of thousands or millions of possibilities. This requires excluding other patients who may have similar names, etc., using a matching algorithm or a community master patient index.
- Determining where records exist that are associated with the particular patient, using a record locator service.
- Obtaining the desired data from each of the records.
- Assembling data in a logical, readable fashion.
- Delivering the information to the site of clinical care.

This is a challenging task, particularly given the desire to deliver information with adequate speed to enhance, rather than retard, the efficiency of care.

For many reasons, including data quality and medico-legal considerations, most Health Information Exchanges do not intend to become owners of the data they are exchanging. They serve only as intermediaries between those who are willing to share data with those who are in need of data.

For this reason, a distributed network with most data living inside the systems of data owners has been proposed as the ideal. Some data providers (larger, more technically proficient organizations) may prefer to store and make data available directly from edge servers on their own networks. However, it is also likely that a large number of provider organizations may not have the capability to respond to data requests in the timely and consistent fashion necessary to serve information at desired speed. Furthermore, delays from querying large number of source systems may degrade the speed with which results are presented to clinical users. Such delays may lead to abandoning the exchange by busy clinicians and their patients.

Thus, while the ownership of data and the stewardship of data quality will remain decentralized to the original data producers, it appears highly likely that regional HIEs may provide servers to store information for many data sharing organizations in the region. Such physically-centralized information (carefully segmented by owner) can also speed the assembly and delivery of requested information. For this reason, a "hybrid" architecture in which some data providers respond to real-time requests with their own data systems, and other providers agree to store mirrored data in a centrally-located repository, is most likely to serve priority information needs during the period of the first five-year *eHealth Action Plan*.

2.0 Use Cases: Real-World Examples of Early Products

2.1 Selecting use cases

Use cases detail how information flows from providers to users so as to create new information products and improvements in care, workflow or cost-efficiency.

As discussed above, various combinations of foundational infrastructure and exchange services can enable scores of different potential information products, each with their own detailed use cases. Overall, the Workgroup recommends that regional HIEs implement exchange services and information products that are technically feasible, for which electronic data is available, and that are sufficiently valued by the region's stakeholders to make them economically self-sustaining. This may (and probably will) vary between one region and another. Thus, there is not necessarily any single set of "starter use cases" that will necessarily be appropriate to every region in the state.

2.2 Early use cases

The Patient Care Workgroup selected a subset of exchange service/information product combinations for consideration by HIEs in Wisconsin based on the following considerations:

- They require relatively simple levels of foundational infrastructure;
- They may have been shown to be relatively self-sustaining or potentially low-cost;
- The set addresses desired outcomes of several stakeholders, including clinicians, public health authorities, patients and payers;
- They mimic several aspects of use cases developed at the Federal level that are intended to inform national initiatives in standards harmonization, application certification, rationalization of privacy and confidentiality statutes, and model implementation projects (the NHIN demonstration prototypes) and thus are likely to be supported by these Federal efforts over time.

These are (in order of increasing complexity of foundational infrastructure):
- A results delivery service enabling the following information products:
  - Electronic delivery of diagnostic results to ordering clinicians
  - Electronic delivery to public health authorities of diagnostic results whose reporting is mandated by law
  - Electronic delivery of diagnostic results to authorized case-managers and disease-managers
  - Electronic delivery of diagnostic images (e.g., radiographs)
- A clinical document delivery service enabling:
  - Electronic delivery from one provider (hospital, emergency room or clinician) to another (such as sending a hospital discharge summary to a primary care clinician)
  - Electronic delivery of alerts or advice from public health authorities to clinicians (such as sending lead-poisoning management advice to a clinician whose patient has just had an elevated blood lead level reported)
  - Document routing that helps HIE populate a master patient index and record locator
- A patient registration messaging service enabling:
  - Authentication of treating clinicians by sending registration data to the HIE
  - Clinician notification of patient admission or discharge

- o Electronic delivery of de-identified statistics of patient demographics and presenting complaints periodically to public health authorities for early outbreak detection
- ▪ A patient-centric summary service enabling:
    - o A longitudinal summary view of a patient's encounters and hospitalization dates, diagnoses and provider names (from claims data)
    - o A longitudinal summary of additional data fields from registration messages (e.g., current health plan, advance directives)
    - o A longitudinal summary view of a patient's diagnostic laboratory results
    - o A longitudinal summary of dispensed prescriptions, medication allergies and immunizations (from data obtained from health plan claims, pharmacy benefit management organizations, pharmacies, immunization registries)
- ▪ A patient health record service enabling:
    - o Patients to store and deliver to providers digital information needed for registration data, medication history, and past medical history (the "electronic clipboard")
    - o Patients to download the longitudinal summary of their dispensed prescriptions
    - o Patients to store and deliver to providers additional information on their medication use
- ▪ A decision support service enabling:
    - o Automatic public health alerts appropriate to a particular demographic or chief complaint sent in response to an appropriate registration message.

2.3 Results delivery use cases

The rationale for leading with this set of information products and their use cases was already summarized in section 1.8, above. As noted, they require the most basic level of foundational infrastructure. In addition, they mimic commonly performed contemporary transactions, and economically self-sustaining examples exist elsewhere. Several such examples, such as HealthBridge in Cincinnati and the Santa Cruz (CA) Health Services Agency, have begun with this base of one-way communication and expanded into more robust information-sharing services.

2.3.1 Results delivery to ordering clinicians
[Note: similar to Harmonized Use Case for Electronic Health Records (Laboratory Result Reporting) - March 19, 2006, Office of the National Coordinator for HIT]

This use case mimics current delivery of diagnostic results to clinicians ordering them, except that all diagnostic providers would use a regional Health Information Exchange to send the information instead of their own printers, fax servers, U.S. mail, etc. This reduces redundant list management costs, and creates economies of scale that allows HIE transmission cost to be substantially less than current costs to individual providers. Thus an HIE can charge a cost-plus per transaction fee or subscription fee, and still provide cheaper service than individual diagnostic organizations could provide for themselves. Other advantages include the ability of clinicians to manage receipt options for all diagnostics at a single location (instead of dealing

with multiple labs); and the receipt of information in a standard form that can reduce the complexity of managing received results.

BEFORE EXCHANGE (today):	AFTER EXCHANGE (tomorrow):
EXAMPLE: DELIVERY: A clinician orders a diagnostic test from a remote laboratory. When the result is completed, that lab must look up how the ordering clinician receives results. This may include paper, fax, portal, printer or electronic messages. The results are sent in any of these formats, none of which are standardized. The lab maintains different systems for each of these transmission methods. The ordering clinician's staff must receive, interpret, and then file, print, copy, scan or transcribe results arriving in many different formats in order to give them to the clinician and file them in the record. **Example: Result look-up:** The clinician must go to separate portals for each diagnostic provider to look up all results for a single patient.	**EXAMPLE:** DELIVERY: A clinician orders a diagnostic test from a remote laboratory. When the result is completed, it is transmitted electronically to the Exchange, which converts the electronic result into a standardized document for delivery by whichever method is preferred by the clinician. Because results arrive in a standardized format, it is easier for clinician office to manage them, including importing them into an electronic medical record system. **Example: Result look-up:** The clinician can look up all results ordered for that patient (regardless of the diagnostic provider) on a single portal.
List management: Every diagnostic test provider must create and maintain its own list of how each clinician receives results. A clinician desiring to change the address or method of delivery must contact every diagnostic provider with the changes.	**List management:** Exchange maintains a single directory of providers with their preferred methods of delivery. Providers specify desired delivery method once for all results to the exchange portal (and change it, as desired, in a single interaction).
Results format: Diagnostic results are printed for providers receiving them by mail or courier; faxed to provider fax machines; stored on a portal for providers using portals, or transmitted to providers electronically.	**Results format:** All diagnostic results are sent to the exchange electronically.
Results sending: Diagnostic provider maintains systems to deliver results by paper, fax, printer or portal and pays all costs for each.	**Results sending:** The exchange routes all incoming results for each provider to the preferred delivery method for that provider (printed, faxed, portal or electronic message). Redundant investment in transmission technologies is eliminated.
Results receipt, filing and look-up: Clinicians receive information in various formats which must be mounted, scanned or transcribed into the record. A different interface for each provider is required for direct import into an Electronic Medical Record. Past results from individual diagnostic providers can only be viewed on	**Results receipt, filing and look-up:** Clinicians receive information in a uniform format which can be mounted, scanned or directly imported as desired. Confirmation of receipt automatically collected by exchange. Only a single interface is needed to import all diagnostic results into an Electronic Medical Record. Past results from all diagnostic

BEFORE EXCHANGE (today):	AFTER EXCHANGE (tomorrow):
their portals.	providers can be viewed on a single HIE portal.
Value: Reduced time and equipment costs for both diagnostic providers and clinicians. Reduced interface costs for clinicians. Increased ease of results management and access for clinicians. Increased uniformity of electronic results improves the clinician business case for acquiring electronic medical records.	
From the patient perspective: Lower costs from reduced administrative overhead in both laboratories and clinician offices. Clinicians have better access to results when seeing patients or managing their problems after office hours.	

Use Case Data Flow
1. Clinician enrolls in the HIE and establishes preferred results receipt methods with the HIE for normal and urgent results (once, and then changed as needed).
2. HIE creates a directory of clinicians and diagnostic providers, including their preferences for sending and receiving results.
3. Clinician orders a test by the regular method.
4. Diagnostic provider completes the requested diagnostic test and records a result.
5. Diagnostic provider sends the result to the ordering clinician using the HIE (selecting the clinician in the HIE directory).
6. Clinician receives the result from the HIE by his/her preferred method.
7. If the clinician receives results in digital form these can be electronically imported into the EMR.

2.3.2 Electronic delivery to public health authorities of diagnostic results whose reporting is mandated by law

Traditional public health surveillance is based on laws requiring clinicians and diagnostic laboratories to report certain diagnoses to the public health authority in the jurisdiction serving the patient. This reporting is typically manual, paper-based, slow and incomplete. Electronic Laboratory Reporting (ELR) has been proposed to increase the speed, volume and completeness of reporting. In these use cases (two different options are presented) the HIE facilitates ELR.

OPTION 1:
1. Public health agency enrolls in the HIE to receive electronic laboratory reports.
2. HIE creates a directory of public health authorities.
3. Diagnostic provider completes a diagnostic test and discerns that reporting is mandated.
4. Diagnostic provider sends the result to the geographically-appropriate public health agency, in addition to the ordering clinician, using the HIE.
5. Public health agency receives the result from the HIE by electronic form.
6. Digital results are electronically imported into a reportable disease case management system.

OPTION 2: In some communities, notably Indianapolis, the HIE has established a different use case that relieves laboratories of recognizing reportable results. In this case

data use agreements enable the HIE to sort through results to identify and send those that
are reportable under public health law:
1. Public health agency enrolls in the HIE to receive electronic laboratory reporting.
2. HIE creates a directory of public health authorities.
3. Diagnostic provider completes diagnostic tests and sends them to the ordering
   clinicians.
4. HIE reviews result codes for mandated reportable conditions.
5. Upon finding a reportable result code (and based on patient address) the HIE
   sends reportable results to the appropriate public health agency.
6. Public health agency receives the result from the HIE.
7. Digital results are electronically imported into a reportable disease case
   management system.

BEFORE EXCHANGE (today):	AFTER EXCHANGE (tomorrow):
EXAMPLE: A laboratory completes a test. The result is one for which reporting to the local public health authority is mandated. A lab worker must recognize the result is reportable, look up which health agency should receive the result, and fill out a form to be mailed to that agency, without interfering with result delivery to the ordering clinician. The public health agency must receive and transcribe paper forms into its case management system.	**EXAMPLE:** (Option 2): As usual, all results are sent to ordering clinicians using the exchange. The exchange detects a result code for which public health reporting is mandated and sends an electronic form to the appropriate public health agency (based on patient address). The public health agency imports the form electronically into its case management system.
List management: Every diagnostic test provider must create and maintain its own list of public health agencies.	**List management:** Exchange maintains a single directory of public health agencies and their preferred methods of delivery.
Mandated result identification: Under current conditions (and Option 1) diagnostic test provider must identify results for which public health notification is mandated.	**Mandated result identification:** Under Option 2, exchange identifies all results for which reporting is mandated.
Report sending: Diagnostic provider fills out required form and typically sends by mail or fax.	**Report sending:** Electronic form is electronically populated by diagnostic provider (or exchange in Option 2) and submitted electronically to public health agency.
Result receipt, filing and look-up: Public health agencies receive most information on paper. A different interface for each provider is required for direct import into case management system.	**Result receipt, filing and look-up:** Public health agencies receive electronic forms; only a single interface is needed to import all data into case management system.
Value: Reduced time and equipment costs for both diagnostic providers and PH agencies. Reduced interface costs for public health agencies. Improved consistency, volume and timeliness of reports (especially with Option 2). Increased speed of reporting. Improved case management saves taxpayer dollars.	
From the patient perspective: Lower costs from reduced overhead in laboratories and public	

health agencies. Faster public health response.

2.3.3 Electronic delivery of diagnostic results to authorized case-managers and disease-managers

Some patients, often those with chronic medical, behavioral or cognitive problems, are enrolled in disease management or case-management programs.   In these cases either the patient or guardian approves the sharing of information with case- or disease-managers, or such information sharing is automatically approved as a condition of the patient using a particular health plan to pay for care, or anonymous information is collected (in the case of some quality measurement programs). Ordering physicians can delegate to the HIE the delivery of a patient's information to these systems when authorized by the patient, guardian or by law.

1. Disease- or case-manager enrolls in the HIE.
2. Clinician provides authorization to the HIE to copy patient results to such systems as authorized by the patient, guardian or by law.
3. Diagnostic provider completes diagnostic tests and sends results to the ordering clinician via the HIE.
4. HIE copies the result to the case- or disease-manager.
5. Disease- or case-manager receives the result from the HIE.
6. Digital results are electronically imported into the case- or disease-management system.

BEFORE EXCHANGE (today):	AFTER EXCHANGE (tomorrow):
EXAMPLE: A patient is enrolled in a disease management program. The case manager writes or calls the patient's clinician office to receive recent laboratory results pertaining to that patient. Office staff pull the chart; find and transcribe desired results; mail them to the case manager. The case manager transcribes results into a case management system.	**EXAMPLE:** The clinician of a patient who has authorized information to go to a disease management program instructs the exchange to electronically copy each result for that patient to the case manager. The case manager imports results electronically into a case management system.
Identification and retrieval: Disease or case managers often must request results from diagnostic or health care providers, who must search for and send requested information.	**List management:** Exchange maintains a directory of patients enrolled in management systems and automatically copies diagnostic results to the authorized management system.
Report sending: Diagnostic or health care provider fills out required form and typically sends by mail or fax.	**Report sending:** Electronic form is electronically populated by exchange and submitted electronically.
Result receipt, filing and look-up: Disease and case managers typically receive information in multiple forms and must transcribe into case management data systems.	**Result receipt, filing and look-up:** Data received electronically from one source and can be imported by one interface into case management data systems.
Value: Reduced time and equipment costs for disease and case managers, diagnostic providers and health care providers. Reduced interface costs for case management systems. Improved consistency, volume, and timeliness of reports. Increased speed of reporting. Improved case	

management improves care quality and efficiency.
From the patient perspective: Lower costs from reduced provider overhead costs. More timely and accurate case management.

2.3.4 Electronic delivery of diagnostic images (e.g., radiographs)

Some clinicians need to receive images, rather than or in addition to, interpretation of those images. These might include radiologists or other clinicians interpreting images or graphic data representations (such as electrocardiograms) in a tele-medicine (long-distance diagnostic assistance) program; to have images to compare with past or future images. The use case information flow directly mirrors 2.3.1, except that an image is digitally delivered instead of text or diagnostic codes.

BEFORE EXCHANGE (today):	AFTER EXCHANGE (tomorrow):
EXAMPLE 1: A patient receive radiographs from an imaging provider. Although the clinician receives an interpretation, he or she desires to review the actual films. Either the clinician travels to the films, requests films be delivered by courier, or instructs patient to obtain copies. When films are unavailable in a timely manner, duplicate testing is often ordered. **EXAMPLE 2:** Radiologist desires to compare current study to films previously obtained at a different location. Must request films be delivered by courier, or instruct patient to obtain copies.	**EXAMPLE:** The clinician requests or looks up digital images using the exchange. Duplicate films reduced. **EXAMPLE 2:** Radiologist requests and reviews old films through the exchange.
Value: Reduced time costs for clinician, patient and imaging provider. Reduced film printing and courier costs. Increase speed and convenience of access. Increased ease of comparing studies. Reduced duplicate films, reduced cost and radiation exposure.	
From the patient perspective: Better image interpretation resulting in fewer false positive and false negative diagnoses. Less time carrying films around. Less cost and radiation exposure.	

2.4 Clinical Document Delivery Use Cases

The same foundational infrastructure needed to deliver results can also be leveraged to deliver other documents. The basic trio of user identity management, secure network, and appropriate data use agreements suffice here as well. Once many different clinicians and other stakeholders are enrolled in a single delivery system, it becomes a trivial matter to enable authorized users to send documents to other users, simply by looking them up in a directory and sending materials to

a secure drop-box. This can greatly enhance collaboration and communication between providers, a health care outcome given high priority for improvement.

2.4.1 Electronic delivery from one provider (hospital, emergency room or clinician) to another (such as sending a hospital discharge summary to a primary care clinician)

Examples of documents that can be sent by this method include referrals for consultation or testing; the reporting of consultations; transfer of digital records from one clinician to another (by patient request or to enhance continuity between two treating clinicians); discharge summaries or other hospital documentation; etc.   The sending entity would need to assume responsibility for adhering to applicable laws and regulations, the same as when it uses U.S. mail or a courier. The HIE could potentially assist compliance by reminding users of what is and is not legal for transmission.

1. Both sending and receiving entities enroll in the HIE and establish preferred result receipt methods (once, and then changed as needed).
2. HIE creates a directory of exchange participants that can be used to send documents between them.
3. Sending entity (for example, an emergency department discharge planner) identifies a document (for example, a patient's emergency department visit record) to be sent to another entity (for example, the primary care clinician identified by the patient).
4. Sending entity selects the receiving entity on the HIE directory, and attaches the document to be sent to the receiving entity.
5. Receiving entity receives the result from the HIE by his/her preferred method.
6. Digital documents can be imported into an EMR or other clinical information management system.

BEFORE EXCHANGE (today):	AFTER EXCHANGE (tomorrow):
EXAMPLE: A patient is discharged from an emergency department or hospital with new medications and self-care instructions. The discharging clinician may or may not copy the discharge dictation to the patient's outpatient clinician. The patient is instructed to seek care from his/her outpatient clinician, and may or may not bring the discharge instructions. Often outpatient clinicians receive no reliable information from the hospital.	**EXAMPLE:** Upon discharge, the discharge summary document is copied to the patient's outpatient clinician using the exchange.
EXAMPLE 2: An outpatient clinician elects to refer a patient to a specialist by filling out a paper form or letter.	**EXAMPLE 2:** Outpatient clinician creates Continuity of Care Record from electronic medical record and sends electronically along with referral question via exchange.
Document sending: After preparation of written materials, sender locates recipient's address or fax number and pays associated costs.	**Report sending:** Recipient selected from directory on HIE; digital text or scanned report sent electronically to recipient's secure electronic drop-box.

Document receipt, filing and look-up: Various mailed and faxed records received, filed or scanned into record system. No remote or later look-up possible except in clinician's own record system.	**Document receipt, filing and look-up:** Data received electronically and can be imported into electronic medical record or printed for paper record systems. Can look up stored documents remotely using exchange portal.
Value: Reduced time and equipment costs for senders and recipients. Ease of sending creates improved consistency, volume, and timeliness of correspondence and greater ease of collaboration between providers. Increased speed of delivery. Easier integration of received documents into electronic records.	
From the patient perspective: Better communication and collaboration between providers. Providers better informed about medications and test results for fewer adverse events and fewer redundant orders and costs.	

2.4.2 Electronic delivery of alerts or advice from public health authorities to clinicians (such as sending lead-poisoning management advice to a clinician whose patient has just had an elevated blood lead level reported)

A special subset of such collaborative communication allows public health agencies to provide relevant information to clinicians managing a case of a reportable disease condition. The simultaneous receipt of a reportable disease result by the public health authority and by the ordering clinician creates a situation in which advice on disease management can immediately follow the test result. This is a primitive version of clinical decision support for public health purposes.

1. Diagnostic result provider sends a result for which mandatory public health reporting is required to both the ordering clinician and the public health agency.
2. Public health agency generates a guidance document detailing appropriate diagnostic, therapeutic and/or preventive actions related to the diagnosis, along with any follow-up information the public health agency is legally authorized to receive.
3. Public health agency sends document to the ordering clinician using the HIE directory.
4. Ordering clinician receives the guidance document shortly after receiving the original diagnostic result.
5. If a legally-authorized request for further information was made, the ordering clinician sends the information to the public health agency using the HIE directory.

BEFORE EXCHANGE (today):	AFTER EXCHANGE (tomorrow):
EXAMPLE: A paper reportable disease result is received by a public health worker several days or weeks after the result was generated. If it appears important, important public health worker can follow-up by looking up the address or phone number of the ordering clinician, who may have already cared for the patient.	**EXAMPLE:** Reportable disease reports are received near-simultaneously by ordering clinician and public health worker (use case 2.3.2). Public health worker can locate clinician on the exchange directory and immediately send a standard advice letter suggesting next steps for diagnosis, therapy or infection control. The document is sent using

	the exchange and delivered according to the preference of the clinician. Clinician may receive advice even before interacting with patient.
Document sending: Currently public health communications with clinicians are time-consuming, often delayed, and often not performed.	**Document sending:** Exchange enables near-real-time and nearly effortless (possibly automated) communication.
Document receipt, filing and look-up: Various mailed and faxed records received, filed or scanned into record system. No remote or later look-up possible except in clinician's own record system.	**Document receipt, filing and look-up:** Data received electronically and can be imported into electronic medical record or printed for paper record systems. Can look up stored documents remotely using exchange portal.
Value: Reduced time and equipment costs for senders and recipients. Greater consistency and timeliness of public health advice and response. Greater collaboration between providers and public health. Increased speed of delivery. Easier integration of received documents into electronic records.	
From the patient perspective: Care informed by expert public health advice. Collaboration between clinician and public health can help definitive care be delivered more efficiently.	

2.4.3 Electronic signature on clinical documents

Several communities with health information exchange have enabled electronic signatures, enabling clinicians to electronically review, sign and return discharge summaries, operative notes and other dictated documents using the exchange. This has been very popular, and reduces medical record administrative costs and clinician time costs.

2.5 Patient Registration Messaging Use Cases

Most hospitals and outpatient practices use software for registering patients for visits, procedures and admissions. This information typically contains up-to-date demographic information, payers, emergency contacts and advance directives in addition to information about chief complaints or admitting diagnoses. If shared by health care providers it would often be available with much shorter delay and somewhat more detail than information from claims (bills). On the other hand, there is currently much less standardization of registration information than there is of claims information (which is now universally-standardized due to HIPAA rules). Submission of a registration record can also serve as a real-time documentation that a purported provider is truly a treating clinician, with certain rights to see a patient's clinical information under HIPAA and state laws.

2.5.1 Authentication of treating clinicians by sending registration data to the HIE

A current message of patient registration is one way of validating that a health care provider is currently a treating clinician for that patient, and thus can be used to authenticate the legitimate

need for information. The value is that this provides a real time validation of providers as treating clinicians, even if they have no prior relationship with the patient.

> 1. Clinician seeking information on a patient from the HIE submits a registration record for real-time documentation of their status as a treating clinician.
> 2. HIE responds to requests for information with complete treatment information after receiving submission of a registration record by authorized HIE participants.
>
> [Note: it may be neither necessary nor desirable to require registration records from authorized and authenticated HIE participants on a routine basis.]

2.5.2 Clinician notification of patient admission or discharge

Continuity of care often suffers when a patient's primary source of outpatient care fails to learn of emergency room visits, hospitalizations and hospital discharge. These are three situations where better communication and coordination can help prevent adverse drug events, redundant testing and other problems that affect both patient health and health care costs.

BEFORE EXCHANGE (today):	AFTER EXCHANGE (tomorrow):
EXAMPLE: A patient is admitted to hospital without the knowledge of the primary care clinician. The busy hospital clinicians fail to notify the primary care clinician, and instead prescribe medicines or other treatments that have previously failed, and order tests already performed by the outpatient provider. When the patient is discharged the primary care clinician will not be notified and may not know of new diagnoses, medication prescriptions or special follow-up needs.	**EXAMPLE:** The primary care outpatient clinician is automatically and rapidly notified of patient admission, and either sends information to the admitting clinician over the exchange, or calls or visits to coordinate care. Similarly on discharge.
Communications: Telephone messages or faxes are sometimes but inconsistently used to notify clinicians of admissions and discharge; these methods are time consuming.	**Communications:** Exchange enables near-real-time and automated notification.
Value: Failed and possibly dangerous treatments and redundant diagnoses are avoided. Continuity of care and collaborative planning are enhanced,	
From the patient perspective: Often patients assume their primary care clinician knows about and is involved in inpatient care. They benefit from continuity of knowledge and experience about their case and avoidance of harm and redundant costs.	

> 1. Physicians who receive diagnostic results through the HIE can elect to be identified on the Exchange as a regular source of care for that patient.
>   [Alternate methods of registering physician-patient relationships can be created.]

2. Patient registration messages for the patient are sent routinely to HIE during emergency room visits, admissions and discharges, including the regular clinician field.
3. Regular-source-of-care clinicians receive notification of ED visit, admission or discharge.

2.5.3 Electronic delivery of de-identified, aggregated statistics of patients' demographics and presenting complaints periodically to public health authorities for early outbreak detection

[Note – similar to *Harmonized Use Case for Biosurveillance (Visit, Utilization and Lab Result Data) - March 19, 2006* of the Office of he National Coordinator for Health Information Technology]

BEFORE EXCHANGE (today):	AFTER EXCHANGE (tomorrow):
EXAMPLE: In Milwaukee in 1993 an estimated 400,000 people had diarrhea as the result of drinking water contamination, but for several days public health authorities were unaware and could not take action. (The cause of the diarrhea was difficult to diagnose and not a legally-reportable disease at the time, so mandated reporting systems did not aid early outbreak detection.)	**EXAMPLE:** A sharp rise in disease incidence would be identified, trigger investigation, and public health authorities could take earlier action to halt the cause and initiate appropriate treatment for hundreds or thousands of patients.
Communications: Detection of outbreaks or non-reportable diseases is sporadic and by telephone.	**Communications:** Exchange enables near-real-time data, and automated algorithms can further speed outbreak recognition.
Value: Faster recognition of disease outbreaks leads to faster investigation and identification of the cause, and better advice regarding diagnosis, treatment and infection control in the community. Also aids management of health care resources in a truly mass event, preserving access to critical care.	
From the patient perspective: Unusual mass illnesses are recognized, and appropriate diagnosis and treatment more rapidly received, while the risk of infection is reduced.	

1. Health care organizations send real-time registration records to HIE.
2. HIE filters name and other personal identifiers from registration and parses remaining data of interest into selected fields of interest (age, gender, time of presentation, zip code of residence, chief complaint).
3. At the end of regular intervals (e.g., hour, day) aggregated statistics on these fields are sent to public health authorities performing early outbreak detection surveillance.
4. Public health agency analyzes temporal, spacial and demographic trends of presenting complaints to identify unusual increases in disease incidence that might mark a disease outbreak

2.6 Patient-centric summary service use cases

The creation of a longitudinal summary of a patient's clinical information from across multiple provider organizations requires one additional level of foundational infrastructure: a community-wide master patient index (CMPI) and record locator (RL). Without these functions, it would not be possible to know with assurance that records belonging to "Robert Smith" in fact all belongs to *the same* Robert Smith whose clinician has requested a summary, and not a different Robert Smith. Failing to index patients correctly could result in sharing the wrong information (information from another Robert Smith), or failing to find much of the information that indeed belongs *the* Robert Smith of interest. A CMPI uses algorithms and, in some cases, a database of previously indexed demographic variables (names, birthdates, sites of care, etc.) to decide which patient records are sought, and which records are highly likely to belong to that individual.

If HIEs simply placed all record information into a single large repository, it would not be necessary to have a Record Locator (RL). However, as noted previously, some data is likely to be maintained by separate participating organizations which must be queried to identify if they have any information on the patient of interest. Even information maintained centrally in the HIE's data systems must be separated by the participating providers who are responsible for owning and maintaining the data. For this reason, creating a summary of a patient's information requires an RL to query all possible sources of data regarding that patient regardless of the degree of data centralization.

Creating CMPI and RL that can adequately serve a region of millions of patients is no trivial matter. It is definitely a higher level of technological and medico-legal complexity than the use cases presented above.

2.6.1 A longitudinal summary view of a patient's encounters and hospitalization dates, diagnoses and provider names (from claims data)

Claims information is almost universally produced by all health care providers, and is now standardized in vocabulary and record format by HIPAA regulations. Such information may be made available after the establishment of acceptable data use agreements by payers, by billing clearinghouses, by claims data aggregators like the proposed Wisconsin Health Information Organization, or by providers themselves. Records could either be maintained in a large repository, or queried as requests for information are received.

Such information could be used to create a chronologically (or otherwise sorted) listing of outpatient encounters, procedures, and hospitalizations, along with the diagnosis codes and provider identities submitted with each. Such a summary offers a snapshot of past health care and potentially useful information that might help treating clinicians in their diagnosis, treatment or coordination of care.

Drawbacks of claims information is that claims frequently are not sent for weeks or months (thus recent information may be lacking). Also, claims records are not created for the purpose of aiding diagnosis or treatment and thus do not enjoy optimum data quality.

BEFORE EXCHANGE (today):	AFTER EXCHANGE (tomorrow):
EXAMPLE: A patient arrives at an emergency room, is unable to communicate, and had not been seen at that hospital previously. The treating clinicians have no idea what problems have been treated in this patient previously or where to get information.	**EXAMPLE:** A summary of the dates of past visits and hospitalizations, the clinicians who cared for the patient, and the billing diagnoses give treating clinicians some information. They can immediately request past medical information from these sources.
Information receipt: None except for patient or family verbal history.	**Information receipt:** Exchange enables near-real-time data.
Information filing and look-up: None	**Information filing and look-up:** Can be mounted in paper chart or electronic record for later use as needed.
Value: Faster identification of past diseases, care, and caregivers. Enables better and faster collaboration and identification of important medical history issues.	
From the patient perspective: Increased likelihood that treating clinicians will be fully informed regarding earlier diagnoses and care. Improved continuity and coordination of care.	

1. Claims data provider organizations establish satisfactory data use agreements with the HIE.
2. Claims data provider organizations either send claims records to be maintained on their behalf in the HIE repository, or make their claims databases available for query by the CMPI/RL.
3. An authorized treating clinician requests a claims information summary on a patient.
4. The CMPI demands sufficient information about the patient to meet matching criteria.
5. The RL seeks records from all data sources with patients matching the CMPI matching criteria.
6. Claims records for matched patients are retrieved by HIE.
7. Data from these records are reassembled into a useful summary format (e.g., a chronological table of dates, providers, diagnoses and procedures).
8. The table is transmitted to the treating clinician by the preferred method.

2.6.2 A longitudinal summary of additional data fields from registration messages (e.g. current health plan, advance directives)

As previously mentioned, claims data may be delayed in availability and also lacks many useful types of information. By supplementing such data with information from patient registration data submitted previously to the HIE, a richer and more timely view of the patient's care, insurance, and personal information is obtained.

BEFORE EXCHANGE (today):	AFTER EXCHANGE (tomorrow):
EXAMPLE: Same as above.	**EXAMPLE:** Same as above, but more timely information, and additional information like emergency contacts and advance directives, further enriches the care of the patient.
Information receipt: None except for patient	**Information receipt:** Exchange enables near-

BEFORE EXCHANGE (today):	AFTER EXCHANGE (tomorrow):
or family verbal history.	real-time data.
Information filing and look-up: None	**Information filing and look-up:** Can be mounted in paper chart or electronic record for later use as needed.
Value: Same as above, but improved timeliness and completeness of information.	
From the patient perspective: Increased likelihood that treating clinicians will be fully informed regarding earlier diagnoses and care, improved continuity and coordination of care, and patient advanced directives.	

1. Registration data are either retained by the HIE on behalf of registration data provider organizations or these organizations make their records available to the CMPI/RL.
2. An authorized treating clinician requests an information summary on a patient.
3. The CMPI demands sufficient information about the patient to meet matching criteria.
4. The RL seeks records from all data sources with patients matching the CMPI matching criteria.
5. Registration records for matched patients are retrieved by HIE.
6. Data from these records are reassembled into a useful summary format along with claims information.
7. The table is transmitted to the treating clinician by the preferred method.

2.6.3 A longitudinal summary view of a patient's diagnostic laboratory results

Diagnostic results are another form of data whose historical presentation can be of great utility in some patients. Such information can reveal that a test was previously performed and need not be repeated, or that the trend of a particular test (such as Hemoglobin A1C to track diabetic blood sugar control) is moving in a desired direction or not.

BEFORE EXCHANGE (today):	AFTER EXCHANGE (tomorrow):
EXAMPLE: No past laboratory information is available on most patients arriving at a new practice, hospital or emergency room, necessitating repetition of prior diagnostics with increased costs, potential harm, diagnostic delay and inconvenience.	**EXAMPLE:** Prior diagnostic results can be viewed by the treating clinician, and results ordered by other clinicians can be included in diagnosis and in the assessment of trends over time.
Information request and receipt: Faxed release of information to multiple sources of care. Results looked up and faxed or mailed back.	**Information receipt:** Exchange enables near-real-time data access with much less labor.
Information filing and look-up: Arrives in multiple (often hard to read) paper formats. Faxes and paper records filed.	**Information filing and look-up:** Results from all sources arrive in single, standard format. Results can be mounted in paper chart or electronic record for later use as needed. If results vocabulary is standardized in the exchange, data can be added to electronic

BEFORE EXCHANGE (today):	AFTER EXCHANGE (tomorrow):
	charts for use in trend graphs, decision support, etc.
Value: Clinicians have more complete information for patient diagnosis, progress assessment and treatment, more rapidly. Improved diagnoses, more refined adjustments to treatment, and reduced redundant testing.	
From the patient perspective: Clinician makes better decisions more rapidly, with less carrying of past tests from visit to visit by patients. All patient diagnostic information (regardless of its source) can contribute to better management.	

1. Diagnostic result data are either retained by the HIE on behalf of diagnostic data provider organizations, or these organizations make their records available to the CMPI/RL.
2. An authorized treating clinician requests an information summary on a patient.
3. The CMPI demands sufficient information about the patient to meet matching criteria.
4. The RL seeks records from all data sources with patients matching the CMPI matching criteria.
5. Registration records for matched patients are retrieved by HIE.
6. Data from these records are reassembled into a useful summary format along with claims and registration information.
7. The table is transmitted to the treating clinician by the preferred method.

2.6.4 A longitudinal summary of dispensed prescriptions, medication allergies and immunizations (from data obtained from health plan claims, pharmacy benefit management organizations, pharmacies, immunization registries)

Data on current and past medications used, along with patient allergy information, is among the information most highly valued by clinicians. Information regarding dispensed prescriptions is typically sent digitally to payers and pharmacy benefit managers, but is typically unavailable electronically for providers and patients. Allergies are recorded in many pharmacy management systems and similarly unavailable to others. Immunizations are currently recorded in two online Wisconsin registries, which require two separate look-ups. Such information can help clinicians prevent adverse drug events related to allergies and interactions. It also provides valuable insight into other health problems that may be (or may once have been) under active treatment. The current emphasis on reducing adverse drug events as a major cause of mortality, morbidity and medical costs has further stimulated demand for the creation of a single, up-to-date medication record (medication reconciliation) by accreditation organizations like the Joint Commission on the Accreditation of Health Care Organizations (JCAHCO).   Information on prescribed pharmaceuticals is among the more highly standardized types of electronic health data, and pharmacies and claims management organizations can be rich sources of information.

BEFORE EXCHANGE (today):	AFTER EXCHANGE (tomorrow):
EXAMPLE: No past pharmaceutical information is available on most patients arriving at a new practice, hospital or	**EXAMPLE:** Prior dispensed medications can be viewed by the treating clinician, and considered both for assessment of the need for

BEFORE EXCHANGE (today):	AFTER EXCHANGE (tomorrow):
emergency room, necessitating lengthy history-taking and increasing risk of drug allergy, interaction or other adverse events.	treatment and to avoid adverse safety events.
Information request and receipt: Faxed release of information to multiple sources of care. Results looked up and faxed or mailed back.	**Information receipt:** Exchange enables near-real-time data access with much less labor.
Information filing and look-up: Arrives in multiple (often hard to read) paper formats. Faxes and paper records filed.	**Information filing and look-up:** Results from all sources arrive in single, standard format. Results can be mounted in paper chart or electronic record for later use as needed. If medication vocabulary is standardized in the exchange, data can be added to electronic charts for use in trend graphs, decision support, etc.
Value: Clinicians have more complete information regarding patient treatment over time yielding improved diagnoses, more refined adjustments to treatment, reduced redundant or ineffective prescribing, and reduced adverse drug events.	
From the patient perspective: Clinician makes better decisions more rapidly with greater patient safety. All patient therapeutic information (regardless of its source) can contribute to better management.	

1. Dispensed prescription medication, medication allergy data and dates and types of immunizations are either retained by the HIE on behalf of data provider organizations, or these organizations make their records available to the CMPI/RL.
2. An authorized treating clinician requests an information summary on a patient.
3. The CMPI demands sufficient information about the patient to meet matching criteria.
4. The RL seeks records from all data sources with patients matching the CMPI matching criteria.
5. Registration records for matched patients are retrieved by HIE.
6. Data from these records are reassembled into a useful summary format either with or without other types of information.
7. The table is transmitted to the treating clinician by the preferred method.

2.7 Patient health record service use cases

Empowering patients (or their guardians and proxies) to play a more active role in their own care is an important goal that can be aided by Health Information Exchange. However, an important prerequisite is for a regional Health Information Exchange to be able to confidently identify that persons requesting information are in fact patients or their proxies, and not other people seeking information for illegitimate ends. Authenticating up to several million users is a formidable problem. Patient Health Records can perhaps be provided more securely and appropriately by organizations that have a more intimate relationship with each patient, such as health plans or health care provider organizations. For this reason PHRs are more likely to be information

products that are actually produced by other organizations, even if they utilize information that comes from the regional HIE.

The following three use cases are largely inspired by the Harmonized Use Case for Consumer Empowerment (Registration and Medication History) - March 19, 2006 of the Office of the National Coordinator for Health IT, which they follow in many particulars.

2.7.1 Patient storage and delivery of digital information for registration data, medication history and past medical history (the "electronic clipboard")

Recurrent repeating of registration and past medical history is one of the most urgently sought changes by patients and their proxies.

BEFORE EXCHANGE (today):	AFTER EXCHANGE (tomorrow):
EXAMPLE: Upon entry to a new provider's office (and sometimes to an established provider) the patient must fill out or provide by interview demographic, billing and other information, often including a health history questionnaire. This is required even if the same information has been repeatedly provided to others in the past.	**EXAMPLE:** Patients have the option of recording their demographics and medical history electronically, and providing it by Internet or portable storage device whenever needed by a provider. Updates can be made as needed by the patient, or if accepted by the patient, by provider registration and other record systems.
Information acquisition: Repeated oral or clipboard presentation.	**Information acquisition:** Patients are provided an opportunity to enter information once and update as needed. In 2.7.2 additional information can be downloaded from service providers to update the patient health record without patient keying.
Information filing and look-up: Often requires re-entry by health care staff. Many opportunities for recall or entry error.	**Information filing and look-up:** No data re-entry needed if the provider uses a compatible registration and electronic medical record.
Value: Reducing repetitious recounting of demographic and medical history information saves time for patients/families and provider organizations. By allowing leisurely data entry, easy updating, centralized easy-to-find storage, and reducing data re-entry, likely increases data quality.	
From the patient perspective: Patient data is "provided once, used many times" and can be updated in an orderly and authoritative fashion in one virtual location (rather than accreting piles of handwritten notes and past records which are carried to clinicians but may be of limited value because the information is relatively inaccessible to providers and caregivers).	

1. Patient establishes a PHR through a health plan, health care provider organization or other vendor.
2. PHR includes forms for recording registration, medication history, and past medical history in a nationally-standardized format (e-clipboard).
3. PHR vendor enrolls in the HIE.

4. Patient authorizes particular health care provider organizations to upload the e-clipboard from their PHR.
5. Health care provider organizations upload e-clipboard information into registration and electronic health record systems, or print out the information for use.

2.7.2 Patients download the longitudinal summary of their dispensed prescriptions

Information regarding dispensed prescriptions is typically sent digitally to payers and pharmacy benefit managers, but is typically unavailable electronically for providers and patients. Such information could be downloaded by Patient Health Records, reviewed by the patient or caregiver for accuracy, and stored to offer to clinicians who may not use an exchange.

BEFORE EXCHANGE (today):	AFTER EXCHANGE (tomorrow):
EXAMPLE: To the extent they have any summary of prescribed medicines, patients or caregivers must record them by hand from prescription bottles or collecting bulky pharmacy handouts. Even this information little helps patients or clinicians assure consistent access to prescribed medicines and adherence to medication use. Commonly patients are encouraged to bring all medicine bottles to the clinician, which are recorded manually for the clinician (but not the patient).	**EXAMPLE:** A record of the medication name, dose, date, amount, and use instructions is electronically added to the patient's PHR via the exchange. The list is available to clinicians through use case 2.6.4, or the patient can send an electronic copy or bring a printed copy. The electronic list can help patients or caregivers manage medication supply and adherence.
Information acquisition: Plastic bottles with labels which are often hard to read.	**Information acquisition:** Data transmitted to patient's PHR and can be looked up or reused in other functions (such as patient inventory management, medication adherence tools or addition to the past medical information section of the PHR).
Information filing and look-up: Hand transcription if any.	**Information filing and look-up:** No data re-entry, rapid information availability, easy to access if medications lost.
Value: Time savings and potential for use by both patients and providers to improve patient safety and medication adherence.	
From the patient perspective: Greater ease in prescription information management and greater ease in detecting errors, managing inventory and medication adherence.	

1. Patient establishes a PHR through a health plan, health care provider organization or other vendor.
2. PHR includes a function enabling uploading of medication history from HIE.
3. PHR vendor enrolls in the HIE.
4. Patient requests medication history from the HIE through the PHR.
5. HIE provides electronic medication history to the patient's PHR.

2.7.3 Patients provide updates or corrections to the medication history on the HIE

Patients may discontinue prescribed medications or begin taking over-the-counter medications without the knowledge of their clinicians. Patients or caregivers are also often the first to note errors in prescriptions or dispensing. Unless patients remember to inform clinicians, and unless the changes are recorded, current and future clinicians care for the patient without knowledge of these events.

BEFORE EXCHANGE (today):	AFTER EXCHANGE (tomorrow):
EXAMPLE: If a patient experiences side-effects, discontinues medications, adds non-prescribed medicines, or notes an error in a prescription the information may not reach the clinician or pharmacist unless the patient recalls it and conveys it. The information may not reach other clinicians or caregivers involved with the patient. The information is not available to those attempting to reduce errors and adverse drug events.	**EXAMPLE:** Patients or caregivers can record such events as they occur in the PHR for access by authorized clinicians or caregivers when needed. The same information can help drive systems to improve the quality and safety of prescription writing and dispensing.
Information acquisition: No routine way to discern such information except oral history at each clinician visit.	**Information acquisition:** Updated medication list from the PHR downloaded by authorized clinicians. Patients can send updates to clinicians. Patients can convey information to safety monitoring systems if they desire.
Information filing and look-up: No orderly system.	**Information filing and look-up:** Routinely collected and stored in a single electronic location.
Value: Improves recording and availability of important information to monitor response to therapy, improve safety and prevent adverse drug events.	
From the patient perspective: Patient data can be "provided once, used many times" on a near-real-time basis. Clinicians can use the information to improve the effectiveness of medical management and reduce patient exposure to injury.	

1. Patient establishes a PHR through a health plan, health care provider organization or other vendor.
2. PHR vendor enrolls in HIE.
3. Patient downloads medication history from HIE
4. Patient uses PHR to annotate medication history to add missing medications, remove incorrect medications, or alter medication information.
5. Annotation is posted by the PHR application onto the HIE. Existing medication summary information is unchanged, but annotations appear as separate, additional information on the summary.

2.8 Decision support service use cases

Many clinical decision support information tools are likely to be embedded in the electronic health records used by individual health care provider organizations. For these to benefit from (i.e., be informed by) patient-centric data from a Health Information Exchange will likely require a still more complex level of foundational infrastructure: the standardization of information into fully machine readable vocabulary which remains on a fairly distant time and cost horizon. However, simpler forms of decision support, sometimes provided today in different forms, can be offered fairly early through HIE.   In particular, public health agencies may be able to provide information tailored to help clinicians become aware of, and adjust their care to, changing incidence or risks of disease in the community. Because it was committed to exploring public health applications of HIE, the Patient Care Workgroup suggested the following use cases that build on capabilities developed in the previously presented use cases.

2.8.1 Automatic public health alerts appropriate to a particular demographic or chief complaint (as received in a registration message)

The proposal to receive real-time registration messages both to authenticate users and to help provide useful information to users creates the following opportunity. Consider if some event has occurred that places residents of a particular geography at risk; for example, the finding of well-water contamination, or a terrorist attack with a dirty (radioactive material) bomb. Alternately, a local outbreak of pertussis (whooping cough) makes it more important than usual that a patient with cough be tested for that condition.   The following use case allows public health agencies to use the HIE to provide real-time decision support for treating clinicians at the point of service exclusively for patients believed to be at risk.

BEFORE EXCHANGE (today):	AFTER EXCHANGE (tomorrow):
EXAMPLE: An outbreak of Shigella sonnei diarrheal disease affects large numbers of infants and pre-schoolers (and their caregivers) in several child-care facilities in a local jurisdiction. Unlike most public health agencies, the local agency *is* equipped to send paper or electronic messages to clinicians and provider organizations (but only the minority of providers on established lists) with instructions in a disease outbreak or other emergency. These were implemented only when each provider established a system to identify affected patients, or the clinician remembers to do so.	**EXAMPLE:** *Any* local public health agency can enter an alert to be sent upon the registration of any pre-school-aged child, or any patient with the chief complaint of diarrhea. Providers are alerted or reminded of the outbreak, and are provided with appropriate diagnostic, therapeutic and infection control information, when and where the information is really needed.
Document sending: Individual health agencies maintain lists of providers and send one-time information by mail, fax, e-mail, or Web portal (the latter exclusively to some	**Document sending:** Exchange enables near-real-time and nearly effortless and automated communication to providers caring for a targeted patient. List maintenance occurs

BEFORE EXCHANGE (today):	AFTER EXCHANGE (tomorrow):
emergency rooms).	routinely on a community level as part of routine functions performed daily by the exchange.
Document receipt, filing and look-up: Letters, faxes and emails from public health authorities end up in the same piles as all other correspondence.	**Document receipt, filing and look-up:** Information is delivered as the patient registers for care, and can be immediately accessed by the clinician.
Value: Greater uniformity and quality of case-finding, diagnosis, treatment, and infection control or other protective measures, improving patient outcomes and increasing the effectiveness and reducing the time to hazard control.	
From the patient perspective: Diagnosis and care are almost universally informed by expert public health advice-- at the *first* visit.	

1. Public health agency becomes aware of a disease outbreak or environmental event that places a particular demographic group at risk OR that should increase the index of suspicion for a particular disease for patients with a particular symptom.
2. Public health agency determines that the problem may require specific diagnostic, therapeutic or prevention considerations in patient care.
3. Public health agency determines which demographic or chief complaint information provided in registration data should trigger specific patient care considerations.
4. Public health agency constructs clinical advice alert to be delivered immediately to the point of care when a registration message contains the relevant demographic (e.g., residence zip code) or chief complaint (e.g., cough) data.
5. Public health agency uploads the clinical advice alert to the HIE and selects the relevant trigger parameters for sending the clinical advice alert.
6. Health care organization submits registration data about a patient meeting the demographic or chief complaint criteria.
7. HIE automatically responds by sending the clinical advice alert to the source of the registration message.

3.0 Develop information on current use of electronic health records in Wisconsin.

Surveys pending- an addendum to be created later.

4.0 Identify positive opportunities and barriers to wider adoption of electronic health information systems in all types of medical care settings. Recommend strategies to take advantage of opportunities and overcome barriers to foster statewide adoption.

Recommendation 12: In regard to HIT adoption:

a. The DOQ-IT program for adoption of electronic medical records should be supported and expanded. The focus should expand it to include specialty practices in addition to primary care.

b. Wisconsin should ultimately subsidize only HIT which is CCHIT-certified and adheres to AHIC (and possibly specific Wisconsin) standards.

c. Wisconsin should address workforce issues to assure success of HIT adoption efforts.

Economic incentives or consequences from Wisconsin government payors (e.g., Medicaid, Employee Trust Fund) could foster greater HIT adoption. These would be the most effective if there are consistent expectations from both public and private plans. Pay-for-performance incentives can, if appropriately implemented, accelerate HIT adoption. [See "eHealth Initiative Foundation. "Parallel Pathways for Quality Healthcare: A Framework for Aligning Incentives with Quality and Health Information Technology." http://toolkit.ehealthinitiative.org/value_creation_and_financing/resources.mspx?Section=384&Category=402&Document=788]